

# You can teach an old friend new tricks, advancements in Natural Refrigerant Technologies that are safe and efficient.

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# The Benefits of Natural Refrigerant Systems

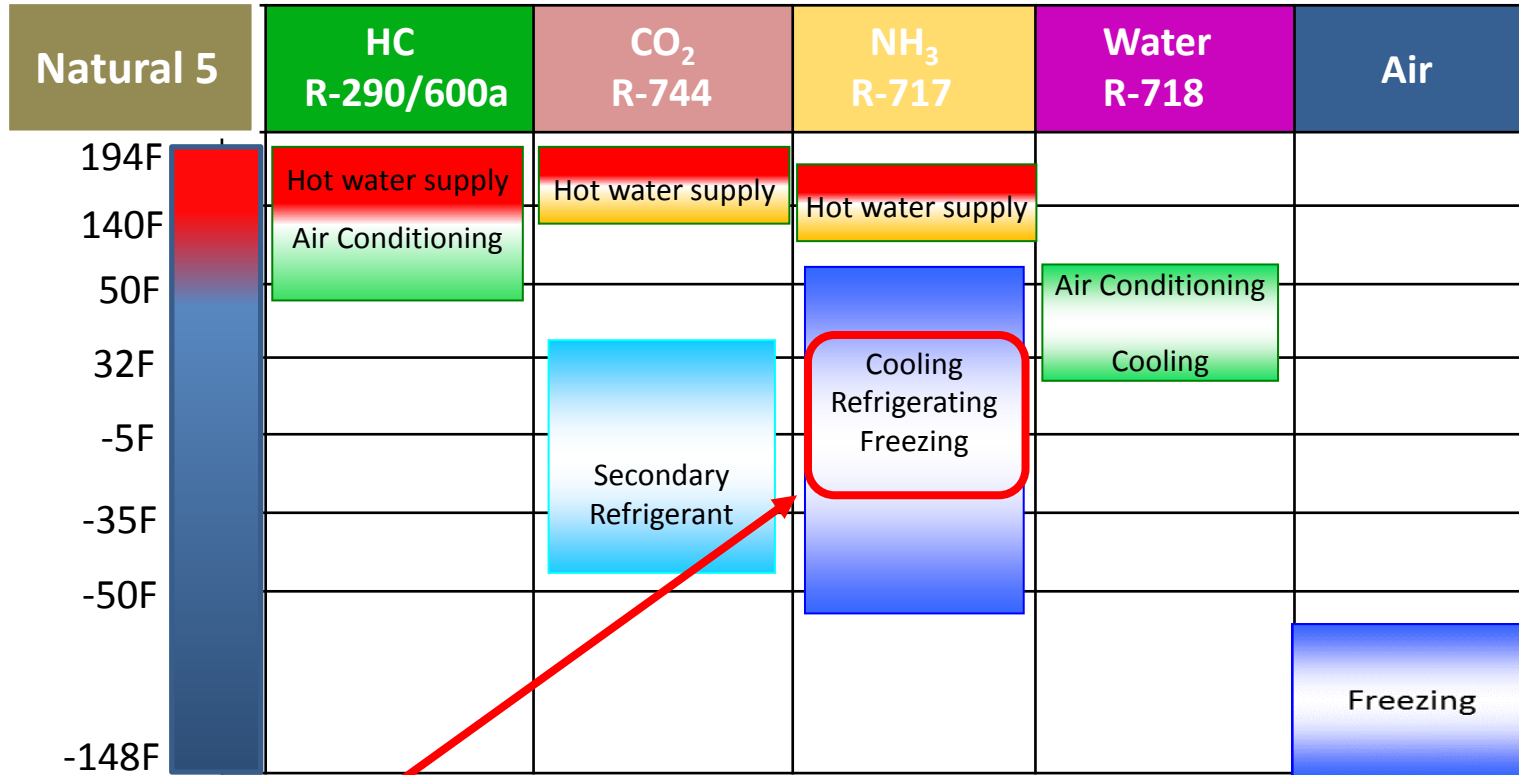


- **Natural Refrigerants are excellent thermodynamic refrigerants that have zero or very low GWP values with the potential to replace many HCFC and HFC refrigerant based systems Worldwide. End users can significantly reduce their GHG impact by using these refrigerants.**
- **The Industry is promoting Natural Refrigerants now as a safe and alternative refrigerant to be used where conditions permit and are allowed, as the efficiency of Natural Refrigerant based systems are very good when compared to other chemical based refrigerants.**
- **Equipment must be designed and engineered to operate as a package using Natural Refrigerants. This ensure that all components used are fully compatible with each other and that top safety standards are met.**
- **Main risk strategy is to develop and manufacture systems with the lowest possible refrigerant charge, yet still maintain high efficiency. By developing factory packaged equipment with a reduced and contained refrigerant charge, this permits applications that were previously unacceptable for Natural Refrigerants.**

**Solution: Factory Packaged Natural Refrigerant Systems**

**MAYEKAWA has developed factory packaged technologies to achieve:**

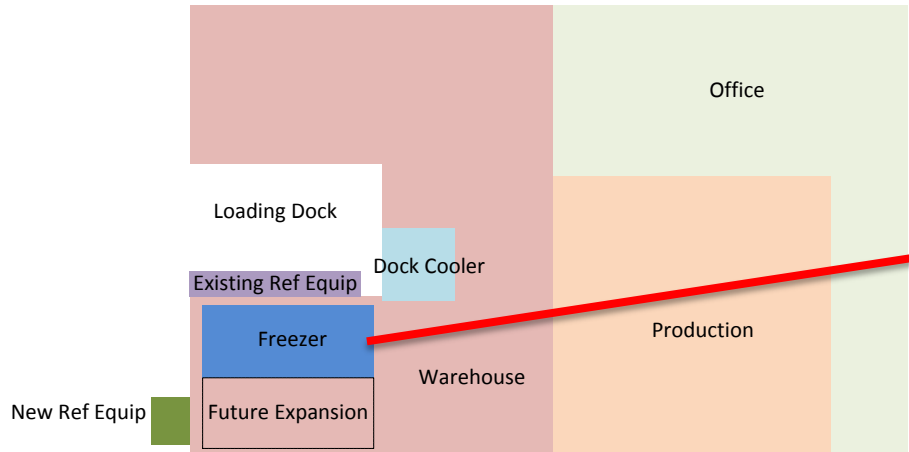
**Energy Conservation and HCFC/ HFC/ HFO free products in a wide temperature range.**



**Presentation Focus**

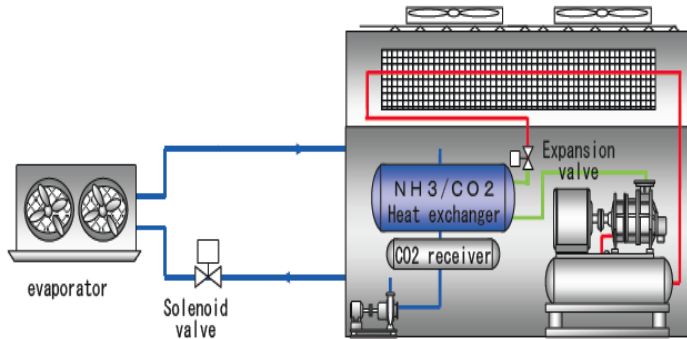
# Food Processor Installation #1 – Cold Storage Freezer

- Existing production facility, Orange County, California location
- Existing 1,800 sq. ft freezer space, 18 ft height at -20F design temperature
- Existing two stage, evaporative condenser R-507a field built system
- Design refrigeration load: 12.5 TR
- Freezer used for short term production storage of frozen mochi dessert



# Food Processor Installation #1 – New System

- New Factory Packaged NH<sub>3</sub> x CO<sub>2</sub> Chiller with tower added outside building
- Package rated at 25.6 TR @ -30F CO<sub>2</sub> supply temperature, less than 50 lb. NH<sub>3</sub> charge
- World's first semi hermetic NH<sub>3</sub> screw compressor with no shaft seal design, very quiet.
- Two new CO<sub>2</sub> air coils added to existing freezer on opposite wall of existing air coils
- Existing R-507a air coils and refrigeration system remain operational during energy testing
- New and Existing systems were alternated for energy comparison using same operating load



**NH<sub>3</sub> / CO<sub>2</sub> Chiller Package**  
**No NH<sub>3</sub> inside building**



**Factory Package  
and Tower**



**New outdoor mechanical area**

**Energy Reduction of 28% compared to R-507a system**

## Low Temperature Semi Hermetic Screw Package

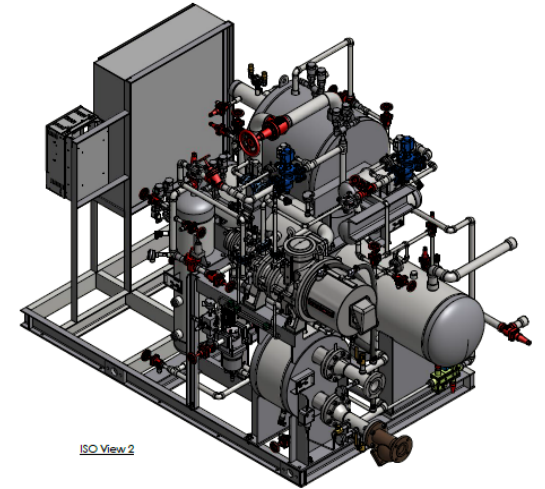
- 0F to -45F CO<sub>2</sub> Supply Temperature range
- 15 TR to 85 TR Capacity range – single compressor
- Internally Compounded Twin Screw Design
- IPM Motor with Integrated VFD
- High Performance Plate and Shell Heat Exchangers
- Low NH<sub>3</sub> Charge with optimized flooded control



Dual Compressor Package



Semi Hermetic Screw Compressor



Compact footprint

**Over 1,000 NewTon Packages Installed Worldwide**

# Beverage Processor Installation #2 – Process Chiller

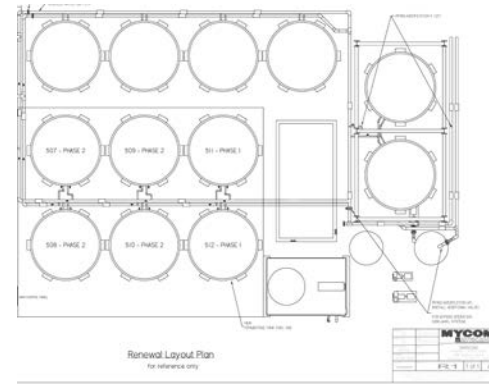
- Existing beverage processing facility, Alameda County, California location
- Existing R-22 evaporative condenser type process chiller, field built
- Existing R-507a water cooled type process chiller, factory packaged
- Design refrigeration load: 44 TR @ 41F CHWS temperature
- Chillers used for cooling process fermentation tanks during Sake production
- Both chillers can be alternated to serve different tank loads using manual ball valves
- Production increase required additional cooling capacity / End User wanted low GWP solution



**Existing R-22 Chiller System  
Engine Room location**



**Fermentation Tank  
Chilled Water Piping**



**Fermentation Tank Area Map**

# Beverage Processor Installation #2 – New System

- New Factory Packaged Air Cooled NH<sub>3</sub> x Water Chiller added on new tank pad
- Package rated at 49.2 TR @ 41F chilled water supply temperature at 95F ambient
- Semi hermetic NH<sub>3</sub> reciprocating compressor with motor VFD
- Air cooled design with micro channel condensers requires no water consumption
- New chiller package has 35 lb. total of NH<sub>3</sub> refrigerant, less than 1 lb./ton
- New and Existing chillers to be alternated for energy comparison using same operating load
- Existing R-22 chiller to be converted to HFO R-448a refrigerant, comparison of both will be evaluated
- Targeted new Air Cooled Package chiller efficiency: .82 kW/ton



**New Process Tank and Mechanical Pad**

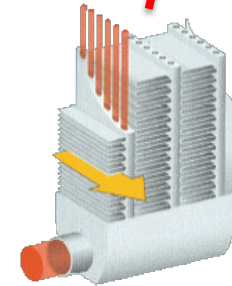


**New NH<sub>3</sub> Chiller and CHW Tank**





- Outdoor rated packages available in 40, 60 & 80 ton models at 45F CHWS temperature and 95F ambient temperature
- Micro Channel Condensers utilized to maintain low NH<sub>3</sub> refrigerant charge, yet maintain high package efficiencies
- NH<sub>3</sub> refrigerant charge less than 1 lb./ton
- Reliable MYCOM semi hermetic reciprocating compressors with VFD control allow for precise temperature control
- Integrated PLC controller with EC condenser fan operation capable of connection to existing BMS automation system



Integrated VFD



Semi Hermetic Compressor – No shaft seal

**Air Conditioning • Process Cooling**

# Thank You!



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